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IS THE PUBLIC HEALTH LAW RESPONSIBLE FOR THE POLIOMYELITIS MYSTERY?

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After 43 years of intensive and expensive research on the virus theory as cause of poliomyelitis, the failure to explain the disease calls for reappraisal of the problem. "If there is adequate understanding of conditions, there is less occasion for guessing," Swayze[1] stated concerning poliomyelitis 41 years ago and this fact is obviously applicable today.

The first, and by all means the foremost fact that must be conclusively established is whether or not poliomyelitis is actually an infectious contagious disease, as has been commonly assumed and stated in the public health law. This assumption, it must be admitted, is almost entirely based on the results of animal experiments rather than on clinical investigations. Simon Flexner[2], in 1911, stated: "We have progressed very far in the management of an infectious disease when we have learned the portals of egress and ingress of the infectious agent. Such knowledge of this kind as we possess regarding epidemic poliomyelitis is based wholly on animal experiments, and hence the degree of application to human beings has still to be established." Yet, in 1951—40 years later—nothing is definitely known regarding the portal of entry into the human body of the so-called virus of this disease, and conclusive proof that a virus actually enters the human body under natural circumstances from without is conspicuously lacking.

The writer[3, 4] has found that in the past no less than 200 names have been applied to poliomyelitis and has pointed out the existence of epidemics of it years ago. Some of our foremost clinicians of half a century ago made it known that they had been cognizant of the disease many years before. Furthermore, many stated that they had not considered it to be infectious or contagious. At the time that a Report of the Special Committee on Anterior Poliomyelitis[5] was read to the members of the American Orthopedic Association and the American Pediatric Society, April 28, 1911, the following comments were made regarding the prevalence of the disease and its communicability in previous years. Chapin[5] stated: "There is one aspect of this disease of considerable interest.

Years ago we never thought of contagiousness with reference to it." Acker[5] stated that he had seen no cases of contagion. "If the disease is so contagious," he said, "I do not understand why the nurses and mothers would not have been infected." Crandall[5] pointed out that he had seen his first cases of poliomyelitis 23 years previously and Morse[5] stated that his first cases went back about 17 years, and a diagnosis of rheumatism had often been previously made on account of the pain. Koplik[5] pointed out that today cases are included that were formerly not recognized as poliomyelitis.

Lovett[6] (1911) indicated that poliomyelitis had been known for a long time to contemporary physicians when he stated: "That infantile paralysis has existed in the United States for an indefinite time is perfectly familiar to us from the fact that we all know of adults affected whose history would reach back fifty years."

In a letter addressed to every children's hospital in this country, Adams[5] asked a certain number of questions, among which was: "Have you ever had a case of poliomyelitis originate in the hospital, or have you any evidence that the disease has spread from patients admitted to the hospital?" As to the disease originating in the hospital, the invariable reply, he says, was, "No."

Sachs[7] (1911) indicates that he was familiar with poliomyelitis before it was generally realized that it occurs in epidemics and that it was not generally considered to be infectious. He says: "Many years ago those of us who were in charge of hospitals and dispensaries had observed the seasonal occurrences of the malady, the early spring and summer being the periods of the year in which the onset of the disease had been most commonly observed. Some ten or fifteen years ago the opinion was hazarded—among, others by the writer—that the disease should be considered one of the infectious diseases of childhood, but this opinion did not gain a firm foothold until the epidemic occurrence of the disease in Norway and Sweden in the late nineties and the early years of this century. Thereafter, a more careful review of the entire subject showed that earlier epidemics had been reported in Europe and in America. . . . But we were not fully alive to the importance of the subject until the epidemic in Greater New York in 1907."

Sachs points out: "Our present knowledge of the possible methods of contagion is based almost entirely upon the work done in

this city at the Rockefeller Institute." This of course placed reliance on animal experiments rather than on clinical investigations. Sachs states that children afflicted with the disease were kept in general hospital wards and that not a single one of the other inmates of the wards of the hospital was affected with the disease.

Simon Flexner[8] (1910) stated: "It was not easy to establish in an individual case precisely how the disease was acquired; it was difficult to bring evidence that was at all convincing that this disease was contagious." L. Emmett Holt[8], in discussing Flexner's paper, stated: "Even five years ago if anyone had suggested that the disease under discussion was an infectious or a contagious one, it would have been looked upon as a joke."

If poliomyelitis was not considered to be an infectious contagious disease a half century ago by outstanding clinicians, we must determine why it has come to be considered infectious since that time. The answer to this reversal of thought concerning the nature of this disease is to be found in the period of medical history between the years 1905 and 1911.

Although an extensive epidemic of poliomyelitis had occurred in Vermont in 1894, that was described by Caverly[9], no extensive outbreak of the disease aroused widespread attention in this country until the 1907 epidemic occurred in New York and Massachusetts. Caverly had stated emphatically 13 years before: "There was a general absence of infectious disease as an etiologic factor in this epidemic. The element of contagion does not enter into the etiology either. I find but a single instance in which more than one member of a family had the disease and it usually occurred in families of more than one child and as no efforts were made at isolation, it was very certain it was non-contagious." Yet, in 1907, and in subsequent years, every effort was made by the New York City and Massachusetts Health Departments to show that poliomyelitis was an infectious, contagious disease. The general attitude at that time appears to be expressed by Sachs[10] when he says: "In general, the epidemic occurrence of any disease is sufficient to prove its infectious or contagious character." It is significant to note that at about this same period in medical history that the infectious and contagious nature of pellagra was also suspected because it occurred in epidemics and convincing evidence to prove this contagion concept was presented by the Thompson-McFadden, Illi-

nois, and Texas Commissions appointed to study the problem. Harris[11] "proved" the disease to be caused by a virus and Tucker[12] concluded from clinical and pathological studies that pellagra is a virus disease. It was, of course, unknown at that time that pellagra is a vitamin deficiency disease and can occur in extensive epidemics.

In 1907, the insistence that poliomyelitis must be a specific infectious disease arose chiefly from the fact that an epidemic of the disease was prevailing. The discovery of the so-called virus of poliomyelitis had not as yet been announced. Epidemics of poliomyelitis, designated by other names, had existed before, but as Manning[13] (1911) states: "The tardy recognition of the epidemic character of poliomyelitis in the last century resulted in a very limited written history or, as we say, epidemiology of the disease."

The attention in this century of the medical profession and the public had never been so focussed upon a disease as it was upon poliomyelitis during the epidemic of 1907, as the considerable amount of discussion given to it in both the public and medical press indicates.

A Collective Investigation Committee of the New York Neurological Society[14], with the cooperation of the committee appointed by the Section on Pediatrics of the New York Academy of Medicine, and the New York Board of Health, was appointed to investigate this epidemic of 1907.

One of the first steps taken by the committee was to send out return postals to the physicians of Greater New York and vicinity, inquiring whether or not the physician in question had seen cases of infantile paralysis during the summer and autumn of 1907. Inquiry blanks were sent to those physicians who replied and these contained certain leading questions. The committee concluded from the returned blanks that poliomyelitis was infectious but not a contagious disease.

The initiative having been taken in New York, the Massachusetts State Board of Health[15] started an investigation to determine the etiology of poliomyelitis modelled after the New York investigation. Receptacles were sent out to physicians reporting cases for collection of stools in order to investigate the gastrointestinal tract as a possible source of infection of the disease.

This investigation, although producing no bacterial evidence of its etiology, nevertheless, not only focused the attention of the medical profession on poliomyelitis as a disease entity but likewise strongly conveyed the idea that the disease was infectious in nature. An editorial in the Boston Medical and Surgical Journal[16] (Sept. 12, 1907) points out this fact when it says: "Taking it as a highly probable point that the disease is due to a specific germ, a circular has been prepared to be sent out to physicians generally, in which a request is made for such reports as would do much toward establishing at least the usual surroundings in which the disease occurs most frequently and thus afford some idea of the conditions favorable to the development and growth of the supposed morbific organisms."

For the first time in the United States the attention not only of physicians but the public as well was focussed on a vast scale on poliomyelitis as a possible infectious contagious disease. Although there was admittedly no conclusive proof of its contagiousness, the general attitude at that time is summed up by Strauss[17] (1911) as follows: "It seems to us despite the lack of absolute proof, that the best interests of the community would be conserved by our regarding the disease from a contagious standpoint."

In May 1910, a joint committee[5] was appointed by the American Orthopedic Association and the American Pediatric Society to communicate to state Boards of Health and other health authorities with regard to anterior poliomyelitis. Circulars were sent to the medical journals and letters to the health commissioners of each state and to each provincial health officer of Canada. These letters urged the physicians and health authorities to study and quarantine the disease, and the journals gave publicity to most of these circulars. The letters to the health officers requested them to take notice of the serious character of the epidemics, the spread of the disease and its contagious nature, and asked them to make the disease reportable and to undertake a field study of epidemics.

By that time poliomyelitis had been made a reportable disease in 23 states and in Ontario and British Columbia. The Committee recommended that the disease be made reportable in all states. It recommended further that all cases be quarantined, sputum, urine and feces be disinfected, and the same rigid precautions adopted as in scarlet fever.

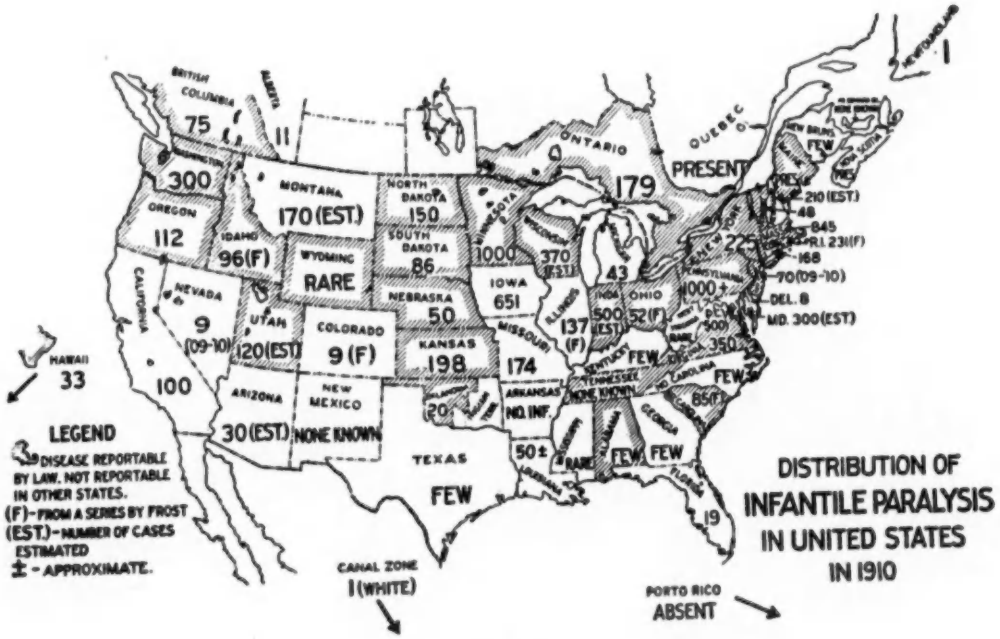
BRITISH COLUMBIA
75
ALBERTA
11
ONTARIO
179
QUEBEC
PRESENT
1
300
OREGON
112
MONTANA
170 (EST.)
NORTH DAKOTA
150
SOUTH DAKOTA
86
IDAHO
96(F)
WYOMING
RARE
NEBRASKA
50
1000
370
43
225
210 (EST.)
48
845
R.I. 23(F)
168
70(09-10)
DEL. 8
MD. 300(EST)
IOWA
651
NEVADA
9
(09-10)
UTAH
120(EST)
COLORADO
9 (F)
KANSAS
198
ILLINOIS
137
(F)
MISSOURI
174
INDIANA
500
(EST.)
OHIO
52(F)
1000+
FEW
500
CALIFORNIA
100
ARIZONA
30 (EST.)
NEW MEXICO
NONE KNOWN
ARKANSAS
NO INF.
20
KENTUCKY
FEW
TENNESSEE
NONE KNOWN
NO. CAROLINA
350
FEW
S. CAROLINA
85(F)
GEORGIA
FEW
FLORIDA
FEW
19
MISSISSIPPI
RARE
LOUISIANA
50±
TEXAS
FEW
HAWAII
33
CANAL ZONE
1 (WHITE)
PORTO RICO
ABSENT
LEGEND
DISEASE REPORTABLE BY LAW. NOT REPORTABLE IN OTHER STATES.
(F)-FROM A SERIES BY FROST
(EST.)-NUMBER OF CASES ESTIMATED
± - APPROXIMATE.
DISTRIBUTION OF
INFANTILE PARALYSIS
IN UNITED STATES
IN 1910

Fig. 1

In the same year (1910), Swayze[1], Professor of Obstetrics and Dean of the Medico-Chirurgical College of Philadelphia, stated that he had received a printed official postal from the Department of Health, over the signature of the Chief Medical Inspector, commanding that he make immediate report of each and every case of anterior poliomyelitis occurring in his practice in the same manner that other communicable diseases are reported to the health authorities. "This arbitrary demand cited infantile paralysis as a contagious affection although bacterial research failed to back up the assumption." In substance, Swayze's reply to the Chief Inspector declined to accept the theory of contagion. In response he received an official envelope containing a duplicate card desiring reports "in the same manner as other communicable diseases" and hoped it was satisfactory. Swayze replied to the effect that the conclusion of contagion was *not* satisfactory and the incident was closed. In his article, "The Infantile Paralysis Muddle," in which this exchange of correspondence appears, Swayze offers evidence that poliomyelitis is simply solar heat prostration. This concept[18] had been considered before and after that time to explain certain cases of this disease. The lesson to be learned from Swayze's insistence that infantile paralysis is not a contagious disease is that, nevertheless according to the law, it is a contagious disease, and that it is illegal to consider it otherwise. The law, clinical observations to the contrary, has to be considered. Poliomyelitis is unique in that it is the only disease in the history of medicine in which a theory, and not an established fact as to its cause, has become incorporated into the public health law.

The year 1910 also showed other intensive efforts not only to gather information regarding poliomyelitis but to imply that it was an infectious contagious disease. The Massachusetts State Board of Health sent out several hundred letters of inquiry to state boards of health, to officers of state medical societies and to prominent physicians in various parts of this country, its dependencies, and Canada.

Statistics reported by Lovett[6] (1911) show the results of this survey. A map of the United States (Fig. 1), on which is marked the number of cases for 1910, showed a total of 8,700 cases. These were the cases of poliomyelitis that were officially reported, in some cases estimated, but this estimate was a poor criterion by which to

judge the total number that had occurred during the year. In half of the states the disease was not as yet reportable; in the states where the disease was reportable, many cases were either unrecognized or unreported when recognized; in other states the alertness of physicians is evident from the number reported. A study of the map, however, shows the widespread and general distribution of the disease after the attention of physicians had been called to it. Obviously poliomyelitis had not spread to the various states indicated. It is equally obvious that diseases which had doubtless been designated by other names in the past were now being reported as poliomyelitis. The known existence of cases of a paralyzing disease such as poliomyelitis, might excite public panic and this understanding may have deferred physicians from making known the prevalence of such cases in the past.

If one takes into consideration the evidence that in 1910 there were officially reported cases of poliomyelitis in the United States in only one half of the states, and that early, mild, or nonparalytic cases that are now reported were not considered to be this disease at that time, it is fair to assume that extensive epidemics existed then and perhaps as great as those of today. To continue the assumption, we may conclude that the incidence of poliomyelitis may not have increased after all, as is commonly supposed.

Collins[19] (1910) made a plea in a paper read before the Association of American Physicians on May 2, 1910, that poliomyelitis be made a reportable quarantinable disease. He based his arguments of contagiousness on the prevalence of epidemics of this disease and on circumstantial evidence. He stated in regard to the so-called poliomyelitis virus: "From a study of the disease clinically, no information has been obtained as to how the virus gains entrance into the system." This point has not been conclusively established even at this date, 41 years later, despite intensive research.

On May 30, 1910, the Academy of Medicine of Paris, France[20], appointed a commission to discuss the expediency of classifying poliomyelitis, or infantile paralysis, among the diseases in which notification is obligatory. The Commission reported to the Academy at its meeting on July 11, 1910, that the disease was first made notifiable in Sweden and Norway in 1905, and that similar action had been taken by many of the North American and Aus-

trian states, and throughout the German Empire. The Commission, therefore, recommended compulsory notification of poliomyelitis in France, quarantine of suspects, patients and convalescents, and subsequent disinfection of premises. These recommendations were adopted.

From this beginning in the period of medical history from 1905 to 1911, poliomyelitis eventually has become throughout the world not only reportable, but according to the law, an infectious contagious disease. From the time that compulsory reporting of poliomyelitis was adopted as a public health measure in certain localities up until the present time when such reporting is universal, the implication that poliomyelitis is an infectious contagious disease has been included in the public health law. If it had been made reportable only and no suggestion as to its possible etiology had been implied in the law, unlimited research would have undoubtedly been carried out during the last half century and the mystery surrounding the disease would probably have been solved.

COMMENT

Although poliomyelitis is legally a contagious disease, which implies that it is caused by a germ or virus, every attempt has failed conclusively to prove this mandatory requirement of the public health law. The manifest truth that we must take into consideration is that progress in poliomyelitis investigations has been impeded by this prematurely formulated public health law. Hoyne[21] (1951) recently summed up our cumulative knowledge of poliomyelitis since it was made a reportable contagious disease as follows: "Notwithstanding the intensive studies of investigators, very little information of practical value has been added to our knowledge of poliomyelitis during the past forty years."

Hoyne points out, as others have also indicated, the rarity for a patient to give a history of exposure to a known case of poliomyelitis; the prevalence of epidemics of this disease in the summer, whereas nearly all common acute infectious diseases occur in seasons when life is principally within doors and schools are in session; the warm weather prevalence which is unusual for a communicable disease; and the inability to prevent poliomyelitis according to the standards employed in preventing known infectious diseases. He then makes the startling revelation that the etiologic agent of the disease is still unknown.

Unlimited poliomyelitis research ceased abruptly when this disease was legally made a communicable disease. However, definnite progress toward a solution to the problem was being made before the public health law made poliomyelitis legally a germ or virus disease. For example, it was reported by toxicologists and bacteriologists that poliomyelitis could be produced both by organic and inorganic poisons as well as by bacterial toxins. The relationship of this disease to beriberi was also being given consideration. However, these investigations lost support when a germ or virus came to be considered by some to be the full and final answer to the problem. Funds for poliomyelitis research were from then on designated for the investigation of the infectious theory only.

Nevertheless, there are today many investigators who have strong evidence contradicting the infectious theory. Vitamin and mineral deficiency, poison, allergy and other theories are being presented to explain the mystery, but these men, because of the public health law and the limited ability to obtain funds or cooperation from any source cannot work freely on the problem of cause of poliomyelitis.

What Louis Bromfield[22] states about research in agriculture in his book, "Out of the Earth," could obviously apply to poliomyelitis investigations if unlimited research were encouraged. He says: "In the long history of mankind, the tiniest observation or speculation of the most humble men (and all really great men are humble in the face of Nature) has sometimes led to vast and dynamic discoveries of the utmost importance to man. Many of the greatest contributions to agriculture in our time have not come from the billion dollar Department of Agriculture nor from the countless Colleges of Agriculture but from a county agent or a farmer who had the power to observe, the imagination to speculate and the logic to deduce a process from which vast benefits have developed. . . . Each day brings forth some new discovery which completely pulls the carpet from under theories which in the past were accepted as facts. It is not impossible that many accredited theories of today may join the exploded superstitions of yesterday." Bromfield points out that circumstances and an apparently impregnable chain of circumstance threw the investigator off the real track. Although he indicates that the pendulum has not infrequently swung in agriculture from one theory to another that provided the full

and final answer to the problem, however, in poliomyelitis investigations it has been impossible for the pendulum to move perceptibly because of the public health law.

The mother, general practitioner, country doctor and clinician have all made important observations during epidemics of poliomyelitis and have formulated their own theories regarding the cause of the disease. However, they have been unable to have these observations seriously considered, especially when they have disagreed with the orthodox concept of the cause of the disease. This situation is admittedly unfortunate since our fundamental knowledge of the disease, as incorporated in the public health law, has originated from laboratory workers experimenting on animals that are not naturally susceptible to poliomyelitis. Jelliffe[23], 32 years ago, cautioned: "The purity of laboratory experimentation is rarely repeated in nature."

Shaw and Thelander[24] (1949) emphasize these facts when they state: "The clinician has not been presented with any sound doctrine regarding its epidemiology and transmission, its precise pathogenesis, or the details of diagnosis and treatment. The clinician who observes the only animal naturally subject to this disease, must develop his own credo regarding most of the aspects of the human form of the disease including not only details of management of the affected patient but also the many hypothetic considerations which influence one's judgement during epidemics."

Shaw and Thelander indicate in the above statement that poliomyelitis is entirely out of the hands of the clinician, a fact that Sachs[25], 41 years before, had also intimated.

At one time or another the classical dietary deficiency diseases, beriberi and pellagra, and even sunstroke, have been considered to be communicable infectious diseases. If by law any one, or all of these diseases, had been made a reportable communicable disease, it is obvious that today it would legally be a germ disease and a search for the causative germ might still be in progress. If beriberi and pellagra had been made reportable communicable diseases, it is conceivable that the epochal studies on vitamins by Funk and subsequent workers could have been ignored in the search for the infectious agent as the etiological factor in these diseases. The progress of medicine would have been seriously retarded.

Yet, in poliomyelitis investigations the continued attempts—unsuccessful to date—to show that a so-called virus enters the human

body under natural circumstances to cause the disease go on over the objections of those who maintain that the so-called virus is not the cause of the disease but rather an endogenous product arising secondary to poisoning, vitamin or mineral deficiency, etc. and despite the protests of the public who demand that all possible causes of poliomyelitis be investigated.

A virus theory has been considered as an etiological factor in relation to other diseases, notably cancer[26], and convincing evidence has been presented to support this hypothesis. Nevertheless, research goes on in this study of cancer cause along many lines of investigation which *include* the virus theory rather than on virus studies only, excluding other theories, as in the investigation of poliomyelitis. If, however, cancer were incorporated in the public health law as a reportable communicable disease as a result of these laboratory studies, it is obvious that unlimited research would cease and that those who maintained noninfectious theories to explain the cause of the disease would neither be able to obtain funds for extensive research nor cooperation for investigating their ideas.

The time is long past due for careful reappraisal of the poliomyelitis problem and for many capable workers with various opinions regarding the cause of the disease to be given the opportunity to work and the funds with which to work. The implications of the public health law that poliomyelitis is an infectious communicable disease must be reconsidered if progress is to be made.

SUMMARY

1. Reappraisal of the poliomyelitis problem is called for on the basis of the failure of the virus theory of cause to explain the disease adequately after 43 years of intensive and expensive research.

2. Poliomyelitis was known to physicians in past generations but its epidemic character was not fully appreciated until relatively modern times.

3. The tardy recognition of the epidemic character of the disease aroused the suspicion that poliomyelitis was an infectious contagious disease although it had not been generally regarded as such in the past.

4. Intensive efforts were made from 1905 to 1911 to acquaint physicians with the disease after its epidemic prevalence was fully

realized and exhaustive, but unsuccessful, efforts were made to prove it to be an infectious contagious disease.

5. Without conclusive proof of its infectious nature or its contagiousness, poliomyelitis was made a reportable communicable disease by a prematurely formulated public health law implying that it is caused by an infectious agent.

6. Although unlimited poliomyelitis research was under way in other fields, notably toxicology, with results that offered promise, research was limited to only one line of investigation—the infectious theory—after the public health law was established.

7. A virus theory has been proposed to explain other diseases, notably cancer, and convincing evidence has been presented to support this hypothesis. However, research goes ahead in this field of medicine along many lines of investigation that *include* the virus theory but does not, as in poliomyelitis studies, exclude other possibilities.

8. The implications of the public health law that make poliomyelitis legally an infectious communicable disease must be reconsidered if progress is to be made.

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